# AEROLOGICAL OBSERVATIONS

[Aerological Division, D. M. LITTLE in Charge]

By LOYD A. STEVENS

Mean free-air data, based on airplane weather and radiometeorograph observations during the month of April 1938, are given in table 1, which includes the basic elements of barometric pressure, temperature and relative humidity at various standard geometric heights. "Means", which have been computed by the customary method of differences, are not given where there are less than 15 observations at the surface or less than 5 at a standard height, except those standard heights within the layer of the monthly vertical range of the tropopause, for which 15 observations are also required. (For further details, see Aerological Observations in the January 1938 MONTHLY WEATHER REVIEW.)

Chart I shows that the mean *surface* temperatures during April were slightly above normal over the greater portion of the country; subnormal temperatures being confined, in general, to the States of Oklahoma, Texas, Louisiana, and southern Mississippi. The highest mean free-air temperatures for the month occurred over Kelly Field, Tex., at 0.5 and 1 kilometer and at 2.5 and 3 kilometers. At 1.5 and 2 kilometers, the highest temperatures occurred over El Paso, Tex., and at 4 and 5 kilometers over Pensacola, Fla. The lowest mean free-air temperatures for the month occurred over Sault Ste. Marie, Mich., at all levels. In general, the mean free-air temperatures for April were higher than for March; the greatest increase occurring over Spokane, Wash., at 5 kilometers where the value for April (−17.2° C) was 10.7° C higher than that for March (−27.9° C). At Kelly Field, Tex., at all levels and at Barksdale Field, La., Maxwell Field, Ala., and Pensacola, Fla., below 3 kilometers, however, the mean temperatures for April were lower than for March; the greatest decrease (−3.3° C) occurring over Kelly Field at 1 kilometer.

Isobaric charts constructed from the mean barometric pressures in table 1, were characterized by a statistical center of low pressure over Fargo, N. Dak., in the lower levels and over Sault Ste. Marie, Mich., in the higher levels. The highest mean pressures occurred over Pensacola, Fla., except that at 4 and 5 kilometers equally high pressure prevailed over Kelly Field, Tex. There was a marked increase, at all levels, in the mean free-air pressure over the northern part of the country for April as compared with March, resulting in a decrease in the south to north pressure gradient across the country.

Free-air resultant winds, based on pilot-balloon observations made near 5:00 a. m. (75th meridian time), are shown in table 2. For the most part the mean resultant wind directions for the month were remarkably close to the normal at nearly all stations and at all levels. The most outstanding variation from the normal occurred over Key West, Fla., between 1.5 and 3 kilometers, where the resultant directions at the successive standard levels for the current month were 106°, 73°, 165°, and 60° as compared with the normal directions of 172°, 222°, 244° and 272°, respectively. Over Pensacola, the resultant directions for the current month at 1, 1.5, and 2 kilometers were 124°, 156° and 199°, respectively, as compared with the normal directions of 237°, 259° and 284°. Over Medford, Oreg., at 4 kilometers the current resultant direction was 200° as compared with the normal for that level of 256°. Resultant velocities were near to or above normal over most stations in the lower levels and over the Lake region at all levels. Below normal resultant velocities occurred, however, over the northwest portion of the country up to 3 kilometers and along the Atlantic Coast at all levels. The greatest positive departure from normal (+4.9 m. p. s.) occurred over Chicago, Ill., at 3 kilometers and the greatest negative departure (−3.4 m. p. s.) occurred over Key West, Fla., at 4 kilometers.

Table 3 shows the maximum free-air wind velocities and their directions for various sections of the United States during April, as determined by pilot-balloon observations. The extreme maximum for the month was 61.7 meters per second from the NNW at 8,860 meters above sea level over Albuquerque, N. Mex.

TABLE 1.—*Mean free-air barometric pressure (P) in mb., temperature (T) in °C., and relative humidities (R. H.), in percent, obtained by airplanes or radiometeorographs during April 1938*

| Stations | Altitude (meters) mean sea level | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | | | | 500 | | | 1,000 | | | 1,500 | | | 2,000 | | | 2,500 | | | 3,000 | | | 4,000 | | | 5,000 | | |
| | Number of obs. | P | T | R. H. | P | T | R. H. | P | T | R. H. | P | T | R. H. | P | T | R. H. | P | T | R. H. | P | T | R. H. | P | T | R. H. | P | T | R. H. |
| Barksdale Field, La.[1] (52 m) | 27 | 1,011 | 15.3 | 87 | 958 | 15.0 | 72 | 903 | 12.4 | 71 | 851 | 10.7 | 64 | 801 | 8.5 | 58 | 754 | 6.7 | 48 | 709 | 4.3 | 42 | 626 | −1.5 | 38 | | | |
| Billings, Mont.[2] (1,090 m) | 29 | 892 | 4.9 | 67 | | | | | | | 848 | 5.6 | 61 | 798 | 3.0 | 59 | 749 | −0.4 | 62 | 704 | −3.7 | 64 | 618 | −9.9 | 65 | 543 | −16.9 | 62 |
| *Boston, Mass.[2] (5 m) | 24 | 1,017 | 6.4 | 76 | 958 | 6.0 | 73 | 901 | 4.6 | 70 | 847 | 1.8 | 68 | 796 | −0.6 | 66 | 748 | −2.7 | 66 | 702 | −5.1 | 66 | 617 | −10.0 | 61 | 542 | −15.9 | 58 |
| Cheyenne, Wyo.[2] (1,873 m) | 29 | 810 | 2.0 | 77 | | | | | | | | | | 798 | 3.9 | 67 | 749 | 2.5 | 56 | 704 | −0.6 | 50 | 620 | −8.2 | 53 | 544 | −15.3 | 49 |
| Coco Solo, C. Z.[3] (15 m) | 29 | 1,009 | 25.0 | 82 | 955 | 22.6 | 88 | 902 | 19.8 | 82 | 851 | 16.9 | 78 | 802 | 14.9 | 68 | 755 | 13.2 | 54 | 712 | 10.9 | 50 | 630 | 5.8 | 40 | 557 | 0.3 | 36 |
| El Paso, Tex.[2] (1,194 m) | 30 | 880 | 12.9 | 29 | | | | | | | 849 | 14.7 | 26 | 800 | 11.8 | 25 | 752 | 8.6 | 26 | 708 | 4.9 | 27 | 625 | −2.5 | 31 | 550 | −9.7 | 31 |
| Fargo, N. Dak.[2] (274 m) | 30 | 982 | 1.7 | 76 | 955 | 3.5 | 71 | 898 | 2.5 | 64 | 843 | 0.5 | 63 | 792 | −2.0 | 63 | 743 | −4.4 | 62 | 698 | −7.1 | 61 | 612 | −12.2 | 57 | 537 | −18.0 | 54 |
| Kelly Field, Tex.[1] (206 m) | 26 | 993 | 17.4 | 74 | 960 | 16.0 | 75 | 904 | 13.2 | 78 | 852 | 12.0 | 68 | 803 | 11.1 | 54 | 755 | 9.3 | 41 | 711 | 6.2 | 39 | 628 | 0.1 | 34 | 554 | −7.6 | 32 |
| Lakehurst, N. J.[3] (39 m) | 24 | 1,015 | 8.0 | 78 | 959 | 9.8 | 59 | 902 | 7.4 | 54 | 848 | 5.1 | 52 | 798 | 2.2 | 54 | 750 | −0.3 | 50 | 704 | −4.1 | 51 | 618 | −10.7 | 44 | 543 | −17.7 | 42 |
| Maxwell Field, Ala.[1] (52 m) | 24 | 1,014 | 15.2 | 80 | 962 | 14.9 | 57 | 906 | 11.8 | 59 | 853 | 8.9 | 56 | 803 | 6.9 | 46 | 755 | 5.4 | 40 | 710 | 4.0 | 30 | 627 | −1.9 | 24 | 552 | −8.7 | 23 |
| Mitchel Field, N. Y.[1] (29 m) | 27 | 1,014 | 7.0 | 81 | 959 | 8.4 | 61 | 902 | 7.0 | 59 | 848 | 4.6 | 58 | 798 | 2.6 | 57 | 749 | 0.7 | 54 | 704 | −1.4 | 50 | 620 | −6.8 | 44 | | | |
| Nashville, Tenn.[2] (180 m) | 29 | 996 | 12.5 | 75 | 959 | 14.2 | 66 | 903 | 11.5 | 69 | 850 | 8.6 | 71 | 800 | 5.9 | 68 | 752 | 3.6 | 61 | 707 | 1.7 | 52 | 624 | −4.1 | 46 | 549 | −10.9 | 43 |
| Norfolk, Va.[3] (10 m) | 21 | 1,019 | 12.9 | 80 | 961 | 14.7 | 49 | 906 | 12.5 | 47 | 853 | 9.2 | 51 | 802 | 6.2 | 54 | 754 | 3.1 | 53 | 709 | 0.4 | 44 | 624 | −5.4 | 36 | 549 | −12.7 | 34 |
| Oakland, Calif.[2] (2 m) | 30 | 1,018 | 10.4 | 85 | 959 | 9.8 | 75 | 903 | 9.6 | 58 | 850 | 7.3 | 54 | 800 | 5.0 | 49 | 751 | 2.4 | 46 | 706 | −0.2 | 46 | 621 | −6.4 | 46 | 547 | −13.2 | 48 |
| Oklahoma City, Okla.[2] (391 m) | 28 | 969 | 11.8 | 83 | 956 | 13.6 | 74 | 902 | 13.1 | 63 | 849 | 11.9 | 56 | 800 | 9.7 | 47 | 752 | 7.2 | 41 | 708 | 4.0 | 40 | 624 | −2.9 | 43 | 550 | −10.1 | 45 |
| Omaha, Nebr.[2] (300 m) | 30 | 979 | 8.4 | 73 | 955 | 9.1 | 65 | 900 | 7.7 | 60 | 847 | 5.5 | 59 | 796 | 3.4 | 58 | 747 | 1.2 | 54 | 703 | −1.4 | 56 | 618 | −7.0 | 54 | 544 | −13.7 | 53 |
| Pearl Harbor, T. H.[3] (6 m) | 30 | 1,017 | 21.2 | 76 | 960 | 20.0 | 73 | 906 | 17.0 | 77 | 854 | 14.6 | 75 | 805 | 12.9 | 61 | 757 | 11.9 | 46 | 713 | 10.4 | 34 | 632 | 6.3 | 24 | 559 | 1.0 | 21 |
| Pensacola, Fla.[3] (13 m) | 26 | 1,019 | 15.8 | 83 | 962 | 15.6 | 65 | 907 | 12.7 | 58 | 854 | 10.4 | 54 | 804 | 8.7 | 46 | 756 | 7.3 | 39 | 711 | 5.4 | 29 | 628 | 0.6 | 20 | 554 | −4.8 | 19 |
| St. Thomas, V. I.[3] (8 m) | 30 | 1,017 | 24.7 | 67 | 961 | 19.8 | 78 | 906 | 16.0 | 82 | 854 | 12.7 | 80 | 805 | 10.7 | 74 | 757 | 10.3 | 56 | 713 | 8.3 | 49 | 631 | 3.5 | 36 | 558 | −1.5 | 29 |
| Salt Lake City, Utah[2] (1,288 m) | 30 | 870 | 6.8 | 63 | | | | | | | 848 | 9.2 | 49 | 798 | 6.8 | 47 | 750 | 3.3 | 50 | 705 | −0.2 | 56 | 620 | −6.4 | 62 | 546 | −13.1 | 57 |

See footnotes at end of table.

TABLE 1.—*Mean free-air barometric pressure (P) in mb., temperature (T) in °C., and relative humidities (R. H.), in percent, obtained by airplanes or radiometeorographs during April 1938*—Continued

| Stations | Altitude (meters) mean sea level | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface | | | | 500 | | | 1,000 | | | 1,500 | | | 2,000 | | | 2,500 | | | 3,000 | | | 4,000 | | | 5,000 | | |
| | Number of obs. | P | T | R. H. | P | T | R. H. | P | T | R. H. | P | T | R. H. | P | T | R. H. | P | T | R. H. | P | T | R. H. | P | T | R. H. | P | T | R. H. |
| San Diego, Calif.[3] (10 m) | 26 | 1,016 | 12.7 | 83 | 958 | 11.9 | 82 | 902 | 10.7 | 72 | 849 | 9.4 | 59 | 800 | 7.0 | 52 | 752 | 5.2 | 46 | 706 | 2.8 | 42 | 623 | −3.2 | 36 | 549 | −10.9 | 34 |
| Sault Ste. Marie, Mich.[3] (221 m) | 26 | 991 | 1.2 | 78 | 957 | 0.9 | 73 | 899 | −0.6 | 68 | 844 | −3.0 | 65 | 792 | −5.1 | 63 | 742 | −6.9 | 60 | 697 | −8.8 | 56 | 611 | −14.0 | 55 | 535 | −19.4 | 54 |
| Scott Field, Ill.[1] (135 m) | 26 | 1,001 | 9.3 | 82 | 958 | 11.7 | 62 | 902 | 9.5 | 62 | 848 | 6.7 | 62 | 798 | 4.6 | 58 | 750 | 2.5 | 52 | 705 | 0.0 | 46 | 621 | −5.8 | 39 | 546 | −13.3 | 44 |
| Seattle, Wash.[3] (10 m) | 22 | 1,019 | 12.3 | 69 | 960 | 8.5 | 72 | 904 | 6.1 | 67 | 850 | 3.3 | 61 | 799 | 0.6 | 56 | 750 | −2.0 | 50 | 704 | −4.6 | 46 | 620 | −10.3 | 47 | ---- | ---- | ---- |
| Selfridge Field, Mich.[1] (177 m) | 19 | 994 | 7.5 | 81 | 957 | 9.2 | 70 | 900 | 7.3 | 69 | 847 | 4.5 | 69 | 796 | 1.8 | 66 | 748 | −0.4 | 58 | 703 | −2.8 | 60 | 618 | −8.3 | 59 | 543 | −14.0 | 49 |
| Spokane, Wash.[2] (597 m) | 30 | 946 | 4.9 | 85 | ---- | ---- | ---- | 901 | 8.0 | 58 | 848 | 5.3 | 56 | 797 | 1.7 | 59 | 748 | −1.9 | 63 | 703 | −4.9 | 62 | 617 | −10.9 | 61 | 541 | −17.2 | 57 |
| Washington, D. C.[3] (13 m) | 26 | 1,018 | 9.9 | 77 | 960 | 12.2 | 53 | 904 | 9.8 | 51 | 851 | 6.7 | 54 | 800 | 3.7 | 56 | 752 | 0.8 | 52 | 707 | −1.7 | 45 | 622 | −7.7 | 40 | 547 | −13.9 | 36 |
| Wright Field, Ohio[1] (244 m) | 26 | 988 | 8.7 | 77 | 958 | 11.0 | 65 | 902 | 8.7 | 66 | 849 | 6.1 | 69 | 798 | 3.5 | 66 | 750 | 1.5 | 51 | 705 | −0.6 | 41 | 621 | −6.1 | 43 | 546 | −11.9 | 43 |
| *Burbank, Calif.[2] (220 m) | 30 | 989 | 9.2 | 82 | 957 | 11.6 | 73 | 902 | 10.5 | 63 | 849 | 9.0 | 52 | 799 | 7.2 | 46 | 752 | 5.2 | 39 | 707 | 2.8 | 36 | 625 | −3.0 | 31 | 550 | −9.7 | 28 |
| Chicago, Ill.[2] (187 m) | 29 | 994 | 7.0 | 78 | 956 | 7.6 | 64 | 900 | 5.4 | 63 | 846 | 2.9 | 61 | 795 | 0.6 | 58 | 746 | −1.3 | 54 | 701 | −3.7 | 51 | 616 | −9.2 | 46 | 541 | −15.6 | 49 |
| **LATE REPORT FOR MARCH 1938** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pearl Harbor, T. H.[3] (6 m) | 311,017 | | 21.2 | 81 | 960 | 19.9 | 79 | 906 | 17.1 | 85 | 854 | 14.8 | 84 | 804 | 13.0 | 76 | 757 | 11.5 | 61 | 713 | 9.4 | 52 | 631 | 4.7 | 37 | 557 | −0.8 | 27 |

Observations taken about 4 a. m. 75th meridian time, except by Navy stations along the Pacific coast and Hawaii where they are taken at dawn.
*Observations by radiometeorograph. Stations not so marked have observations by airplane.

[1] Army.
[2] Weather Bureau.
[3] Navy.

NOTE.—None of the means included in this table are based on less than 15 surface or 5 standard-level observations.

TABLE 2.—*Free-air resultant winds (meters per second) based on pilot-balloon observations made near 5 a. m. (E. S. T.) during April 1938*

[Wind from N=360°, E=90°, etc.]

| Altitude (meters) m. s. l. | Albuquerque, N. Mex. (1,554 m) | | Atlanta, Ga. (309 m) | | Billings, Mont. (1,095 m) | | Boston, Mass. (15 m) | | Cheyenne, Wyo. (1,873 m) | | Chicago, Ill. (192 m) | | Cincinnati, Ohio (157 m) | | Detroit, Mich. (204 m) | | Fargo, N. Dak. (283 m) | | Houston, Tex. (21 m) | | Key West, Fla. (11 m) | | Medford, Oreg. (410 m) | | Nashville, Tenn. (194 m) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity |
| | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | |
| Surface | 299 | 1.4 | 263 | 0.6 | 318 | 1.4 | 314 | 1.7 | 287 | 3.4 | 226 | 0.6 | 218 | 0.3 | 240 | 1.4 | 13 | 1.2 | 122 | 0.8 | 94 | 2.7 | 319 | 0.9 | 183 | 1.0 |
| 500 | ---- | ---- | 232 | 3.5 | ---- | ---- | 306 | 6.0 | ---- | ---- | 242 | 4.7 | 236 | 4.1 | 256 | 5.7 | 91 | 0.9 | 177 | 3.9 | 107 | 6.0 | 309 | 0.7 | 224 | 5.6 |
| 1,000 | ---- | ---- | 237 | 3.3 | ---- | ---- | 302 | 4.9 | ---- | ---- | 264 | 7.1 | 254 | 8.1 | 268 | 8.7 | 339 | 3.1 | 235 | 2.6 | 104 | 3.7 | 236 | 0.5 | 230 | 6.5 |
| 1,500 | ---- | ---- | 243 | 3.2 | 269 | 2.4 | 277 | 6.1 | ---- | ---- | 263 | 8.5 | 256 | 10.6 | 267 | 8.7 | 321 | 6.1 | 242 | 3.8 | 106 | 1.4 | 183 | 1.9 | 249 | 6.7 |
| 2,000 | 273 | 4.0 | 232 | 2.2 | 285 | 3.0 | 276 | 7.7 | 290 | 5.1 | 273 | 9.7 | 262 | 11.8 | 276 | 9.3 | 319 | 7.0 | 261 | 4.9 | 73 | 0.3 | 225 | 2.9 | 248 | 7.7 |
| 2,500 | 275 | 5.2 | 281 | 4.1 | 289 | 3.7 | 280 | 8.7 | 289 | 7.8 | 276 | 11.7 | 268 | 10.6 | 274 | 10.7 | 317 | 9.6 | 270 | 5.7 | 165 | 1.0 | 235 | 2.5 | 267 | 8.0 |
| 3,000 | 268 | 5.9 | 269 | 6.1 | 285 | 6.0 | 285 | 8.9 | 287 | 6.7 | 296 | 14.2 | 267 | 10.2 | 290 | 9.4 | 322 | 11.2 | 271 | 5.0 | 60 | 1.0 | 253 | 3.1 | 268 | 8.6 |
| 4,000 | 266 | 8.6 | 287 | 5.8 | 300 | 8.8 | 294 | 8.6 | 285 | 8.9 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 255 | 1.6 | 200 | 3.4 | ---- | ---- |
| 5,000 | 276 | 9.9 | ---- | ---- | 279 | 8.6 | ---- | ---- | 267 | 6.9 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- |

| Altitude (meters) m. s. l. | Newark, N. J. (14 m) | | Oakland, Calif. (8 m) | | Oklahoma City, Okla. (402 m) | | Omaha, Nebr. (306 m) | | Pearl Harbor, Territory of Hawaii[1] (68 m) | | Pensacola, Fla.[1] (24 m) | | St. Louis, Mo. (170 m) | | Salt Lake City, Utah (1,294 m) | | San Diego, Calif. (15 m) | | Sault Ste. Marie, Mich. (198 m) | | Seattle, Wash. (14 m) | | Spokane, Wash. (603 m) | | Washington, D. C. (10 m) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity |
| | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | | ° | |
| Surface | 294 | 1.2 | 247 | 0.9 | 178 | 1.3 | 177 | 0.5 | 53 | 4.2 | 94 | 1.6 | 212 | 0.9 | 178 | 2.4 | 279 | 0.4 | 42 | 0.7 | 162 | 1.1 | 120 | 0.9 | 301 | 0.7 |
| 500 | 283 | 4.6 | 288 | 2.6 | 182 | 5.1 | 220 | 1.7 | 70 | 6.9 | 114 | 3.6 | 229 | 4.7 | ---- | ---- | 315 | 1.4 | 117 | 1.1 | 159 | 1.3 | ---- | ---- | 293 | 4.7 |
| 1,000 | 291 | 6.2 | 320 | 4.2 | 215 | 9.9 | 251 | 3.8 | 77 | 7.6 | 124 | 2.2 | 250 | 7.7 | ---- | ---- | 334 | 3.3 | 273 | 2.9 | 197 | 1.0 | 213 | 2.2 | 291 | 6.5 |
| 1,500 | 271 | 7.0 | 313 | 3.7 | 237 | 7.6 | 269 | 5.5 | 79 | 6.1 | 156 | 1.7 | 266 | 7.6 | 170 | 2.9 | 333 | 3.7 | 289 | 4.0 | 215 | 3.2 | 242 | 2.7 | 283 | 8.0 |
| 2,000 | 275 | 9.4 | 301 | 4.0 | 253 | 6.7 | 281 | 6.5 | 94 | 4.0 | 199 | 0.9 | 276 | 8.7 | 192 | 1.9 | 319 | 4.0 | 288 | 5.1 | 228 | 1.8 | 247 | 3.4 | 284 | 9.8 |
| 2,500 | 274 | 11.1 | 297 | 3.8 | 257 | 6.7 | 300 | 7.4 | 57 | 1.9 | 249 | 2.6 | 272 | 8.2 | 228 | 2.4 | 312 | 5.6 | 281 | 6.7 | 243 | 2.8 | 248 | 4.3 | 274 | 8.9 |
| 3,000 | 273 | 8.5 | 299 | 5.1 | 272 | 6.8 | 296 | 8.8 | 61 | 1.1 | 280 | 3.5 | 276 | 8.7 | 251 | 3.3 | 318 | 7.7 | 282 | 5.6 | 254 | 2.6 | 251 | 5.2 | 270 | 9.3 |
| 4,000 | ---- | ---- | 272 | 7.2 | 286 | 8.0 | 300 | 13.4 | 84 | 1.3 | 286 | 7.3 | 297 | 9.6 | 239 | 5.2 | 315 | 8.0 | 300 | 9.4 | ---- | ---- | 249 | 7.1 | 284 | 9.1 |
| 5,000 | ---- | ---- | 262 | 10.1 | 291 | 6.8 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 263 | 5.9 | 306 | 7.7 | ---- | ---- | ---- | ---- | 244 | 8.2 | ---- | ---- |

[1] Navy stations.

TABLE 3.—*Maximum free-air wind velocities (meters per second) for different sections of the United States based on pilot-balloon observations during April 1938*

| Section | Surface to 2,500 meters (m. s. l.) | | | | | Between 2,500 and 5,000 meters (m. s. l.) | | | | | Above 5,000 meters (m. s. l.) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Maximum velocity | Direction | Altitude (m), m. s. l. | Date | Station | Maximum velocity | Direction | Altitude (m), m. s. l. | Date | Station | Maximum velocity | Direction | Altitude (m), m. s. l. | Date | Station |
| Northeast [1] | 42.9 | SW | 1,740 | 3 | Pittsburgh | 44.6 | WSW | 3,420 | 1 | Albany | 40.8 | WNW | 7,560 | 7 | Albany. |
| East-Central [2] | 36.0 | NW | 1,410 | 10 | Richmond | 38.2 | W | 5,000 | 1 | Nashville | 44.6 | WSW | 5,500 | 1 | Nashville. |
| Southeast [3] | 36.0 | S | 1,580 | 8 | Tampa | 38.4 | W | 4,980 | 3 | Charleston | 42.0 | W | 6,240 | 4 | Charleston. |
| North-Central [4] | 35.3 | WNW | 930 | 20 | Bismark | 40.6 | NNW | 4,430 | 22 | Sault Ste. Marie | 43.7 | W | 6,590 | 6 | Sault Ste. Marie. |
| Central [5] | 36.3 | WNW | 1,540 | 3 | Chicago | 36.0 | WNW | 4,120 | 4 | Indianapolis | 42.0 | NW | 8,550 | 22 | Moline. |
| South-Central [6] | 39.0 | WNW | 990 | 8 | Houston | 39.6 | W | 4,150 | 2 | Vicksburg | 33.6 | WNW | 5,890 | 3 | Amarillo. |
| Northwest [7] | 26.2 | W | 2,310 | 18 | Spokane | 33.9 | WSW | 3,170 | 18 | Spokane | 37.8 | NW | 8,820 | 6 | Pendleton. |
| West-Central [8] | 46.6 | S | 2,360 | 25 | Rock Springs | 43.4 | S | 2,510 | 25 | Rock Springs | 56.0 | NNW | 8,780 | 6 | Modena. |
| Southwest [9] | 32.1 | W | 2,370 | 15 | El Paso | 41.6 | SSW | 5,000 | 26 | Albuquerque | 61.7 | NNW | 8,860 | 6 | Las Vegas. |

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except El Paso), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

# RIVERS AND FLOODS

[River and Flood Division, MERRILL BERNARD in charge]

By BENNETT SWENSON

Following a relatively wet March in most sections of the country from the Appalachians westward, scattered sections received excessive rainfall during April. The heaviest amounts occurred in the central portions of Mississippi, Alabama, and Georgia, over the middle Missouri and upper Mississippi Basins, and in portions of Texas and Louisiana.

Moderately heavy rains over portions of the Mississippi-Alabama-Georgia area on April 1–2, were followed by heavy rains on April 6–8. The excessive rainfall resulted in severe floods, particularly in the Alabama, Tombigbee, Pascagoula, and Pearl River systems.

The official in charge, Montgomery, Ala., reports on the flood in the Alabama River as follows:

On the morning of April 7 moderate rains were reported in the upper watersheds and moderately heavy to heavy rains below Gadsden, Ala., to Montgomery.

Very little rain fell during the day of the 7th, but during the night and on the morning of the 8th, very heavy downpours occurred. The averages for 2 days were approximately 5.00 inches, fairly evenly distributed in the drainage basin above Gadsden, and 7.90 below, with the mean of all stations equal to 6.59 inches. Several stations in the only really flashy portion of the Coosa River basin reported torrential rainfall, 11.79 inches at Clanton; 9.65 at Leeds; and 9.37 at Goodwater. Also reported were 8.81 inches at Union Springs and 12.69 at Selma.

Critical situations had developed over night at Rome, Ga., and Wetumpka, Ala., with 7 a. m. stages on the 8th of 25.0 feet at Rome and 53.7 feet at Wetumpka. It is believed that the operation, by the Alabama Power Co., of its dams reduced somewhat the crest at Montgomery.

Due either to a change in channel conditions or to unusual behavior of backwater, the crest discharge of approximately 210,000 second-feet at Montgomery gave only a 54.2-foot stage in this flood against 56.9 for identically the same peak discharge in the 1929 flood.

Heavy rainfall occurred over the Black Warrior and Tombigbee River basins at several periods during the latter half of March and the first 2 days of April and was followed by unusually heavy rains on April 6–9. The rainfall in the latter period ranged from 5 inches in Black Warrior basin to 13 inches or more in the Tombigbee watershed south of Demopolis, Ala.

The Black Warrior reached a stage of 63.0 feet at Tuscaloosa, Ala., on April 8. The Tombigbee River crested at all of the locks south of Demopolis 4 days before it crested at Demopolis. This is not the usual procedure as floods to the south of Demopolis, in large rises, come from the Black Warrior and Little Tombigbee Rivers through Demopolis. At locks 1 and 2 the excessive rainfall caused stages that were unprecedented for rainfall in the lower Tombigbee.

The following report on the floods in the Pascagoula and Pearl Rivers was prepared by the official in charge, Meridian, Miss.:

Heavy rains were reported at intervals over the entire Meridian district during the latter part of March. Pearl River was above the flood stage at Jackson, Miss., and Pearl River, La., at the beginning of April. Heavy rains were again reported over most of the district on April 1 and 2, again during the 6th to 8th, and a period of moderate to heavy rains from the 17th to the 20th. The rains were more or less spotted as shown by the following table of monthly amounts of rainfall for April at the various river and rainfall stations:

| Station | Rainfall (Inches) | Station | Rainfall (Inches) |
|---|---|---|---|
| Bay Springs, Miss. | 12.63 | Jackson, Miss. | 10.13 |
| Collins, Miss. | 12.72 | Leakesville, Miss. | 4.44 |
| Columbia, Miss. | 9.93 | Meridian, Miss. | 16.44 |
| Dlo, Miss. | 15.06 | Merrill, Miss. | 5.16 |
| Edinburg, Miss. | 9.00 | Monticello, Miss. | 14.21 |
| Enterprise, Miss. | 16.98 | Pearl River, La. | 3.92 |
| Franklinton, La. | 6.30 | Pelahatchee, Miss. | 9.56 |
| Hattiesburg, Miss. | 7.06 | Philadelphia, Miss. | 10.20 |
| Hickory, Miss. | 18.08 | Shubuta, Miss. | 18.70 |

The total monthly precipitation at Meridian for April, 16.44 inches, was 11.66 inches above the normal. It is the greatest amount of precipitation for April in some 50 years of record and has been equalled or exceeded twice, namely, 18.77 inches in January 1937, and 20.06 inches in June 1900.

For the period April 6–8, the 24-hour amounts of rainfall, ending at 6:10 a. m., C. S. T., at Hickory, Meridian, and Enterprise, were as follows:

| Date | Meridian | Hickory | Enterprise |
|---|---|---|---|
| 6 | 0.67 | 1.07 | 1.10 |
| 7 | 2.99 | 3.36 | 3.64 |
| 8 | 5.76 | 3.77 | 6.20 |
| Total | 9.42 | 8.20 | 10.94 |